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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ROBERT STEPHEN LEWANDOWSKI, LOWELL SCOTT
SMITH, CHARLES EDWARD BAUMGARTNER, DAVID MARTIN
MILLS, DOUGLAS GLENN WILDES, RAYETTE ANN FISHER, and
GEORGE CHARLES SOGOIAN¹

Appeal 2009-015254
Application 10/814,956
Technology Center 3600

Before KEVIN F. TURNER, JEFFREY B. ROBERTSON, and DANIEL S.
SONG, *Administrative Patent Judges*.

TURNER, *Administrative Patent Judge*.

DECISION ON APPEAL²

¹ The real party in interest is General Electric Company (App. Br. 2).

² The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, or for filing a request for rehearing, as recited in 37 C.F.R. § 41.52, begins to run from the "MAIL DATE" (paper delivery mode) or the "NOTIFICATION DATE" (electronic delivery mode) shown on the PTOL-90A cover letter attached to this decision.

The inventors (“Appellant”) appeal under 35 U.S.C. § 134(a) from a final rejection of claims 1-10, 12, 35-37 and 39 (App. Br. 2). We have jurisdiction over this appeal under 35 U.S.C. §§ 6(b) and 134(a).

The claimed subject matter is directed to a sensor device comprising a substrate, sensor elements arranged on the substrate, and barriers arranged in the substrate to provide acoustic and/or electrical isolation between the sensor elements so as to address the problem of cross-talk (Spec. p. 4, ll. 3-26; p. 7, ll. 7-13). Figure 6 is reproduced below.

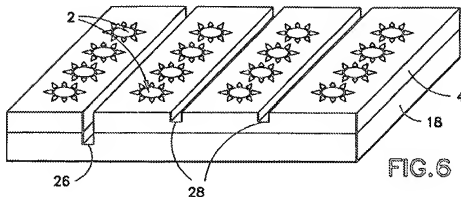


Figure 6 depicts a capacitive micromachined ultrasonic transducer (cMUT) device comprising a backing layer 18; a substrate 4 on the backing layer 18; an array of transducer elements 2, each including multiple cMUT cells; and acoustic isolation trenches 26, 28 formed in the substrate 4 between transducer elements 2, in which the isolation trenches 28 have a depth less than the thickness of the substrate 4 (Spec. p. 6, ll. 14-16; p. 7, ll. 14-15; p. 11, ll. 6-19).

Claim 1 is representative of the appealed claims and reads as follows
(App. Br. 15, Claims App'x.; emphasis added):

1. A sensor device comprising:
a multiplicity of sensor elements arranged at
a front surface of a substrate, each of said sensor
elements being in contact with material of said
substrate; and
*a multiplicity of barriers arranged in said
material of said substrate to reduce the coupling of
a form of energy between any of said sensor
elements, each barrier posing an obstacle to the
propagation of said form of energy impinging
thereon, wherein the multiplicity of barriers extend
into said material of said substrate but not
completely through said material of said substrate,
and wherein said barriers and adjoining portions
of said substrate are coated with a thin layer of
insulating material.*

Independent claim 35 is directed to an ultrasonic transducer device comprising a multiplicity of ultrasonic transducer elements arranged on a substrate, a multiplicity of trenches disposed between the transducer elements to obstruct the propagation of acoustic wave energy through the substrate, and a coating of insulating material provided on the barriers and adjoining portions of the substrate (App. Br. 16-17, Claims App'x.).

THE REJECTIONS

The Examiner rejected claims 12 and 39 under 35 U.S.C. § 112, second paragraph, for alleged indefiniteness.

The Examiner rejected claims 1-10, 12, 35-37 and 39 under 35 U.S.C. § 103(a) over Khuri-Yakub (US 6,262,946 issued Jul. 17, 2001) in view of

Miller (US 6,669,644 issued Dec. 30, 2003) and Watanabe (US 6,051,868 issued Apr. 18, 2000).

We AFFIRM.

ISSUES

1. Whether the Examiner erred in finding that claims 12 and 39 are indefinite under 35 U.S.C. § 112, second paragraph.
2. Whether the Examiner erred in concluding that it would have been obvious to combine Khuri-Yakub, Miller and Watanabe to result in the claimed sensor device comprising a multiplicity of sensor elements, a multiplicity of barriers arranged to reduce coupling of energy between any of the sensor elements, and a coating of insulating material provided on the barriers and adjoining portions of the substrate.

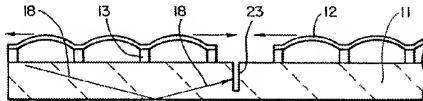
FINDINGS OF FACT

The record supports the following findings of fact (FF) by a preponderance of the evidence.

1. Appellant's specification describes that a coating of an insulating material can be applied to cMUT devices after forming isolation trenches in the substrate between cMUT elements (Spec. p. 13, l. 28 – p. 14, l. 18)
2. Appellant's specification describes providing electrical isolation of cMUT elements separated with isolation trenches by coating a surface (e.g., the walls) of the trenches with an electrically

conductive material and connecting this material to ground (Spec. p. 15, ll. 10-16).

3. Khuri-Yakub discloses cMUT arrays in which cross-talk is minimized (col. 1, ll. 12-15). Figure 10 of Khuri-Yakub is reproduced below.



FIG_10

Figure 10 of Khuri-Yakub shows a portion of a cMUT array including a substrate 11; transducer elements with membranes 12 on the substrate 11; and a channel 23, which extends partially through the thickness of the substrate 11 and surrounds the transducer elements to reduce cross-coupling of acoustic energy (col. 2, ll. 36-37; col. 4, ll. 18-25).

4. Miller discloses a micro-machined ultrasonic transducer (MUT) including a substrate 220; MUT elements 210 including MUT cells 216 formed on the substrate 220; and vias 215 (i.e., holes) formed in the substrate 220 proximate to each cell 216 to reduce propagation of acoustic energy waves traveling through the substrate 220 (col. 3, ll. 26-48; FIG. 2).
5. Watanabe discloses a semiconductor device comprising trenches 104, 105 surrounding transistors 108, 109, in which

inner walls of the trenches 104, 105 are covered with a film of insulating material (col. 4, ll. 23-27; FIG. 1A).

PRINCIPLES OF LAW

35 U.S.C. "Section 103 forbids issuance of a patent when 'the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.'" *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007).

In order to rely on a reference under 35 U.S.C. § 103, it must qualify as analogous prior art. The two separate tests for determining whether a prior art reference is analogous are: (1) whether the reference is from the same field of endeavor, regardless of the problem addressed; and (2) if the reference is not within the inventor's endeavor, whether the reference is reasonably pertinent to the particular problem with which the inventor is involved. *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004).

Regarding 35 U.S.C. § 112, second paragraph, "the definiteness of the language employed must be analyzed-not in a vacuum, but always in light of the teachings of the prior art and of the particular application disclosure as it would be interpreted by one possessing the ordinary level of skill in the pertinent art." *In re Moore*, 439 F.2d 1232, 1235 (CCPA 1971).

ANALYSIS

Rejection of claims 12 and 39 under 35 U.S.C. § 112, second paragraph

Independent claim 1 recites, *inter alia*, the limitation that barriers and adjoining portions of the substrate are coated with a thin layer of *insulating* material (App. Br. 15, Claims App'x.). Claim 12 depends from claim 1 and recites the limitation that a surface of each of the trenches is coated with an *electrically conductive material* that is grounded (App. Br. 16, Claims App'x.). The Examiner contends that claim 12 does not further limit, and appears to contradict, the subject matter of claim 1 (Ans. 3-4). Similar analysis of claim 39, which recites similar subject matter, was also made.

The Appellant argues that claim 12 complies with 35 U.S.C. § 112, second paragraph, for several reasons. First, the Appellant contends that claim 12 is definite because the specification describes that the surface of each trench may be coated with an electrically conductive material that is grounded (App. Br. 7-8; Reply Br. 2-3; FF 2). The Appellant also contends that the coating of electrically conductive material may be applied *in addition to* coating the trenches and adjoining portions in the substrate with a thin layer of insulating material (*see* FF 1), and it is not contradictory to coat the trenches with *both* electrically conductive and insulating materials (Reply Br. 3).

We find that one skilled in the art would have interpreted claim 12, when read in light of the specification, as further defining the sensor device recited in claim 1 as *additionally* comprising a coating of electrically conductive material applied to the surface of each trench (Reply Br. 3). In other words, in view of the specification, we find the meaning of claim 12 to

be clear. Hence, we find that the language of claim 12 is in compliance with 35 U.S.C. § 112, second paragraph. We find the interpretation of claim 39 to follow likewise. Thus, we reverse the Examiner's indefiniteness rejection of claim 12, as well as claim 39.

Rejection of claims 1-10, 12, 35-37 and 39 as obvious over Khuri-Yakub in view of Miller and Watanabe

As to claim 1, the Examiner contends that Khuri-Yakub discloses all claimed limitations except for (1) a *plurality* of barriers, as Khuri-Yakub shows only a single channel 23 (i.e., barrier); and (2) the barriers and adjoining portions of the substrate 11 being coated with an insulating material (Ans. 5; FIG. 10; FF 3). The Examiner relies on Miller for the disclosure of a plurality of vias 215 (i.e., barriers) in a substrate 220 for reducing coupling of energy between sensor elements on the substrate (Ans. 5, 7-8; FIG. 2; FF 4), and additionally relies on Watanabe for the disclosure of trenches in a semiconductor device that are coated with insulator material for reducing cross-talk (Ans. 5, 8; FF 5). The Examiner concludes that it would have been obvious in view of Miller to include a multiplicity of barriers between the sensor elements of Khuri-Yakub to provide increased reduction in cross-coupling between the sensor elements (Ans. 5-6), and that it would have been obvious in view of Watanabe to coat these barriers with an insulating material to further reduce lateral energy propagation (Ans. 6).

The Appellant contends that Miller teaches a plurality of holes (vias) 215 etched completely through the MUT substrate 220, while the claimed barriers each have a depth less than a thickness of the substrate (App. Br. 10-

11). The Appellant also argues that Miller's holes cannot reasonably be interpreted as barriers (or trenches), as claimed (Reply Br. 4), and that one skilled in the art would not be motivated to use a multiplicity of channels 23 in Khuri-Yakub merely because Miller discloses a multiplicity of holes (Reply. Br. 5).

We agree with the Examiner's position that it would have been obvious to include a multiplicity of barriers between the sensor elements in Khuri-Yakub's device. First, "[i]t is well settled that the mere duplication of parts has no patentable significance unless a new and unexpected result is produced." *In re Harza*, 274 F.2d 669, 671 (CCPA 1960). The Appellant has not, however, shown any new or unexpected results produced from duplicating the known trench structure. Indeed, we agree with the Examiner's implicit position that increasing the number of channels in Khuri-Yakub's device would be *expected* to further reduce cross-coupling (i.e., increase acoustic isolation) between additional sensor elements in the cMUT array (Ans. 5-6).

Secondly, Miller teaches that the vias located proximate to each MUT cell reduce propagation of acoustic energy waves traveling through the substrate (FF 4). Although Miller's vias extend relatively further into the substrate than Khuri-Yakub's channel 23 (FIG. 10), these vias, like the channel 23, are also empty spaces in a substrate that function as "barriers" to the propagation of acoustic energy between MUT elements arranged on the substrate. In light of this identical function of Miller's vias, we agree for this additional reason that one skilled in the art would have found it desirable and

obvious to include a multiplicity of barriers between the sensor elements in Khuri-Yakub.

The Appellant contends that Watanabe discloses the use of trenches to reduce cross-talk only in the context of separating transistors, not in the context of separating transducer arrays as disclosed by Khuri-Yakub (App. Br. 12; Reply Br. 5-6); and that modifying Khuri-Yakub's system to incorporate trenches as disclosed by Watanabe would change the principle of operation, and require a substantial redesign, of Khuri-Yakub's system, rendering render the system inoperable for its intended purpose (App. Br. 12-13; Reply Br. 6).

Appellant's arguments are not convincing. The Examiner acknowledges that Watanabe discloses devices that include transistors, while Khuri-Yakub discloses devices that include transducer arrays (Ans. 8). However, the Examiner also explains that both the Watanabe and Khuri-Yakub systems are arranged on a substrate that allows for propagation of cross-talk, and both systems seek to eliminate cross-talk (Ans. 8). Indeed, the Appellant acknowledges that Watanabe discloses the use of trenches to reduce cross-talk (Reply Br. 6).

To the extent that the Appellant may be contending that Watanabe does not qualify as analogous prior art, this argument is not convincing. Watanabe is directed to reducing cross-talk between electronic elements arranged on a substrate and, accordingly, is highly pertinent to the same problem with which the claimed subject matter is involved. Thus, we find that Watanabe is analogous prior art. *See In re Bigio*, 381 F.3d at 1325.

Also, the Examiner does not contend that Watanabe's trenches can be

physically incorporated into Khuri-Yakub, but rather proposes modifying Khuri-Yakub only by applying a coating of insulating material to surfaces and adjoining regions of barriers (Ans. 9). In addition, "it is not necessary that the inventions of the references be physically combinable to render obvious the invention under review." *In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983). The Examiner takes the position that the proposed modification in Khuri-Yakub would be well within the capabilities of one having ordinary skill in the art (Ans. 9). The Appellant has not provided any persuasive evidence to show that the modification would not be within the capabilities of one of ordinary skill in the art, much less to show that the modification would change the Khuri-Yakub system's principle of operation and render it inoperable for its intended purpose. Thus, we find no reversible error in the Examiner's position.

The Appellant also argues that the Examiner has not shown the requisite motivation or suggestion to modify or combine the applied references (App. Br. 13). This argument is foreclosed by *KSR*, in which the Supreme Court rejected the rigid requirement of a teaching, suggestion or motivation to combine known elements in order to establish obviousness. *KSR*, 550 U.S. at 418-19. What is required is an articulated reason with a rational basis to support the conclusion of obviousness. *Id.* at 417-418. In the present case, we find that the Examiner has, as required, stated a rational reason for combining Khuri-Yakub, Miller and Watanabe together; that is, to further reduce cross-coupling between sensor elements and lateral energy propagation (Ans. 5-6). Hence, we find no error in the Examiner's position.

Thus, we sustain the Examiner's obviousness rejection of claim 1, as well as claims 2-10 and 12 depending therefrom, which the Appellant does not separately argue. While independent claim 35 recites slightly different elements from claim 1, Appellant argues claims 1 and 35 together and does not argue specific elements of claim 35 separately. Thus, for similar reasons, we also sustain the rejection of independent claim 35, as well as claims 36, 37 and 39, which depend therefrom.

CONCLUSION

1. The Examiner erred in finding that claims 12 and 39 are not in compliance with 35 U.S.C. § 112, second paragraph.
2. The Examiner did not err in concluding that it would have been obvious to combine Khuri-Yakub, Miller and Watanabe to result in the claimed sensor device comprising a multiplicity of sensor elements, a multiplicity of barriers arranged to reduce coupling of energy between any of the sensor elements, and a coating of insulating material provided on the barriers and adjoining portions of the substrate.

DECISION

1. We REVERSE the Examiner's rejection of claims 12 and 39 under 35 U.S.C. § 112, second paragraph.
2. We AFFIRM the Examiner's rejection of claims 1-10, 12, 35-37 and 39 under 35 U.S.C. § 103(a) over Khuri-Yakub in view of Miller and Watanabe.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

ack

cc:

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